THE OHIO JOURNAL OF SCIENCE

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REPORT OF THIRTY-SEVENTH ANNUAL MEETING OF THE OHIO ACADEMY OF SCIENCE

The Thirty-seventh Annual Meeting of the Ohio Academy of Science was held at the Ohio State University, Columbus, on April 15 and 16, 1927, under the presidency of Dr. William McPherson. Approximately 150 members and quite a large number of visitors were in attendance at the various general and sectional meetings. As shown elsewhere in this report, the scientific program contained a large number of excellent papers and addresses, covering a wide range of topics, many of them eliciting an unusual interest.

Sixty-nine new members were elected so that at the close of the meeting the membership of the Academy stood at 503.

The following is the general program of the meeting:

FRIDAY, APRIL 15.

9:00 A. M.—Business meeting.

10:30 A. M.—Presentation of papers in general session.

1:00 P. M.—Presentation of papers in sectional meetings.

6:30 P. M.—Annual banquet, Ohio Union.

8:00 P. M.—Invitation address by Prof. C. E. McClung, Professor of Zoology, University of Pennsylvania, on "The Mechanism of Heredity," in the University Chapel.

SATURDAY, APRIL 16.

8:30 A. M.—Adjourned business meeting.

9:30 A. M.—Presentation of papers in general session, including a lecture by Dr. Robert A. Millikan, Director of the Norman Bridge Laboratory of Physics, California Institute of Technology, on "The Birth of a Light Ray."

Minutes of the Business Meetings.

The first business meeting was called to order by President McPherson at 10 A. M., Friday, April 15, 1927, in Room 100 of the Botany and Zoology Building, Ohio State University, with about 50 members present.

The President announced the following committee appointments:

Committee on Membership—Geo. D. Hubbard, H. M. Benedict, W. H. Shideler.

Committee on Resolutions—E. L. Moseley, W. F. Mercer, H. M. Benedict.

Committee on Necrology—L. B. Walton.

The Academy then proceeded to the election of an *Auditing Committee*. S. R. Williams and F. C. Waite were elected.

The following *Nominating Committee* was elected by ballot by the Academy: S. R. Williams, R. J. Seymour, C. F. Moses, M. E. Stickney, W. H. Alexander, and Harold E. Burtt.

The reports of the following officers and standing committees were called for, read and ordered filed: The Secretary, the Treasurer (read by Prof. Herbert Osborn in the absence of the Treasurer), the Executive Committee, the Publications Committee (no report), the Trustees of the Research Fund, the Library Committee, and the Committee on State Parks and Conservation.

A second business meeting was held in the same place on Saturday, April 16, at 8:45 A. M. President McPherson opened the meeting by extending words of welcome and good wishes on behalf of President Rightmire, President of the Ohio State University, who was unable to be present. At this meeting the reports of special committees on membership, nominations, necrology, auditing, and resolutions were made and accepted.

On motion of Dr. R. J. Seymour, seconded by Prof. F. O. Grover, it was voted to adopt the recommendation of the Executive Committee amending Chapter 1, Section 1, of the By-Laws, increasing the annual dues of the Academy from $2.00 to $2.50 per year, effective at the beginning of the next fiscal year.

It was also agreed that the sum of $1.50 per member should be paid annually to the *Ohio Journal of Science.*

Upon motion duly seconded the Academy extended a vote of thanks to the *Ohio Journal of Science* for its splendid cooperation and contributions in the past.

Upon motion of Dr. Edward L. Rice, seconded by Prof. L. B. Walton, the question of immediate financial relief to the *Ohio Journal of Science* was referred with power to the incoming Executive Committee.

At the suggestion of the chairman of the Auditing Committee it was voted to refer the Treasurer's report to the auditor of the Ohio State University for final auditing. (The chairman explained that this action is necessary because of the insufficiency of the data in the possession of the Auditing Committee, due to the sudden and unexpected absence of the Treasurer from the meeting).

The amendment to the Constitution proposed at the last annual meeting (see Ann. Rep., 36th Meeting, p. 25), amending Article III, Membership, was briefly explained by the Secretary and unanimously agreed to.

At the suggestion of the chairman of the Committee on State Parks and Conservation, the President was authorized to appoint a sub-committee from the Standing Committee on State Parks and Conservation to work with the State Forester in the formulation of regulations for the protection of the plant and animal life of the State forests.

The Secretary then read a communication from Prof. H. M. Benedict extending an invitation from the University of Cincinnati to the Ohio Academy of Science to hold the next annual meeting in Cincinnati. Moved by Professor Walton that the Academy express its appreciation of the invitation and that the matter be referred without recommendation to the Executive Committee. Carried.

The Secretary was requested to extend the greetings and good wishes of the Academy to Mr. Joe H. Todd, Wooster, in recognition of his having "traveled past his 90th milestone."

Adjourned 9:40 A. M.

Reports.

Report of the Secretary.

Columbus, Ohio, April 15, 1927.

To the Ohio Academy of Science:

The routine affairs of the secretary's office—and they were more numerous than ever and increasing—were taken care of as promptly and as efficiently as circumstances would permit.

The first task of major importance after the last annual meeting was the preparation of the minutes of the meeting and the reports of officers and committees for publication as the "Proceedings of the Ohio Academy of Science," Thirty-sixth Meeting. Through the courteous cooperation of the Publications Committee and the Editor of the *Ohio Journal of Science* these proceedings were ready for distribution very much earlier than usual, together with a suitable title page and contents to Volume VII. prepared by Mrs. Ethel M. Miller. A summary was also prepared for and published in *Science.*

In the latter part of May (May 28, 29 and 30, 1926) the Geology Section of the Academy, under the leadership of Vice-President Wilber Stout, ably assisted by Prof. J. Ernest Carman, organized and successfully carried out a field trip into northern Ohio for an inspection and study of the Silurian and Devonian Systems of the Sandusky Bay Region. This trip took the party into Seneca, Sandusky, Ottawa and Erie counties. We commend the Geology Section on its field work.

The Ohio Academy of Science having received a very courteous invitation from the President, the Trustees and the Faculty of Western Reserve University, in the City of Cleveland, to be represented at the ceremonies commemorating its Centennial on the 12th and 13th of November, 1926, the Secretary with the hearty approval of the President requested Dr. Dayton C. Miller, of the Case School of Applied Science, to act as the representative of the Academy on this occasion. Dr. Miller kindly agreed to do so and sends the following report:

Cleveland, Ohio, March 9, 1927.

The Ohio Academy of Science, Dr. W. H. Alexander, 16 East Broad Street, Columbus, Ohio.

My Dear Dr. Alexander:—In accordance with your request, I attended the ceremonies commemorating the Centennial of Western Reserve University held on November 12 and 13, 1926. I presented the greetings of The Ohio Academy of Science and formally signed the book of delegates representing the Learned Societies of America. I attended various exercises. The principal subjects considered were the Junior College Movement, the Training of Teachers and Research and Training for Research. A number of important addresses were given. I am enclosing a program which gives the details regarding the various papers presented. I am, also, enclosing the formal list of delegates. You will find the Ohio Academy of Science listed near the top of the fourth page of the list.

I am sure that the University appreciated the interest and good will of the various societies which sent delegates and it was a privilege and an honor to be permitted to represent the Ohio Academy of Science.

Very truly yours,

Dayton C. Miller.

As shown on page 25 of the Proceedings of the Thirty-sixth Annual Meeting, the Treasurer, Dr. A. E. Waller, was made the representative of the Academy at the International Botanical Congress that assembled at Ithaca, N. Y., in August, 1926, and as such Doctor Waller submits the following report of the meetings:

COLUMBUS, OHIO, August 30, 1926.

Dear Mr. Alexander:

As delegate of the Ohio Academy of Science, I attended the International Plant Congress held at Ithaca, New York, during the period of August 16th to 23rd. Over eight hundred members attended and all countries engaged in productive scientific work were represented. Most of the addresses were read by the foreign delegates, but round table discussions and informal conversations formed an important phase of the Congress.

I was so fortunate as to be asked by Professor Schaffner to accompany him in the journey east, thereby cutting in half my railroad expenses.

With all good wishes,

Sincerely yours,

A. E. WALLER.

The Secretary attended the Philadelphia meeting of the American Association for the Advancement of Science, in December, 1926, and represented the Academy at all meetings of the Council. He was honored by the President of the Association with appointment on the nominating committee of five and also served as one of the two tellers at the election of the President. On December 29, 1926, at an informal meeting of the representatives of the affiliated state academies at which eleven of the nineteen affiliated academies were represented it was decided to form a temporary organization and the undersigned was made the temporary chairman. The purpose of this meeting, as stated by Dr. McGill, secretary of the Tennessee Academy of Science, at whose suggestion the meeting was called, was:

> "To effect an organization of the representatives of the affiliated state academies in the Council of the American Association for the Advancement of Science at this time in order to arrange for a possible round-table discussion by the representatives on the occasion of the next meeting of the American Association for the Advancement of Science at Nashville, Tennessee, in December, 1927."

In the latter part of March of this year, we received a letter from the Permanent Secretary of the American Association for the Advancement of Science, Dr. Burton E. Livingston, advising that the Association was planning a special campaign for new members and that a portion of the campaign would be related to the affiliated academies of science, and inclosing the first draft of the proposed circular letter regarding which he asked for critical suggestions. The letter as approved, gives due emphasis to the arrangement of affiliation between the academies and the Association. Doubtless by this time all members of the Ohio Academy who are not already members of the A. A. A. S. have received this letter and we hope have given it very careful consideration. As you know, members of the Academy under the terms of affiliation, are exempt from the payment of the $5.00 initiation fee and fifty cents out of the $5.00 annual dues is returned to the Academy.

In this connection, it may be proper to say that during the past few weeks the secretary has given much time and effort in calling to the attention of persons eligible to membership the claims of the Academy and through the cordial cooperation of members of the Academy we are able to present for your consideration at this meeting 43 nominees for membership.

Respectfully submitted,

WILLIAM H. ALEXANDER, *Secretary.*

Treasurer's Report for the Year 1926–1927.

To the Ohio Academy of Science:

Your Treasurer submits the following report of the financial condition of the Academy. The period covered is from April 1, 1926, to March 31, 1927.

RECEIPTS.

Cash Balance of April 1, 1926	$ 716.08
Interest on certificate of deposit	39.00
Dues from members and allowance from the A. A. A. S.	922.14
Total receipts, Exhibit A	$1,677.22

DISBURSEMENTS.

C. E. Wilson, for Academy poster	$ 1.50
The Neil House, Dr. Johnson's account	17.30
Wm. H. Alexander, Secretarial expenses	22.67
Wm. H. Alexander, Secretary's honorarium	100.00
Dr. Douglas Johnson, travel expenses for lecture	54.00
Diehl Office Equipment Company	1.85
A. E. Kraus Print Shop, programs, etc	86.00
Hiss Stamp Company	1.15
Wm. H. Alexander, Secretarial expenses	4.88
Spahr & Glenn Company, bill forms and envelopes	5.00
The Columbian Building & Loan Company, certificate of deposit	350.00
A. E. Waller, travel expenses to International Plant Congress	19.72
Helen Coleman, assistance to Treasurer	9.24
Spahr & Glenn Company, 600 due slips	3.75
Postmaster, Columbus, Ohio, stamped envelopes	26.92
C. G. Shatzer, expenses for attending executive meeting	2.50
Spahr & Glenn Company, envelopes	3.25
Mrs. Katherine D. Sharp, refund on overpayment	2.00
Schmitt Printing Company	24.25
W. H. Alexander	33.90
The Ohio Journal of Science for 1927 account	400.00
Eight returned checks for $2.00 each	16.00
Total disbursements, Exhibit B	$1,185.88

BALANCE SHEET.

Exhibit A—Receipts	$1,677.22
Exhibit B—Disbursements	1,185.88
Cash balance on hand April 1, 1927	$ 491.34

There is one uncancelled check outstanding. The Secretary's honorarium has always been paid at the beginning of the period following the Annual Election and is to be deducted from the present balance.

The same is true for the expenses of the present meeting. Against this, there will be some additional income from the allowance of the A. A. A. S. and the sale of publications. But there is no denying the fact that there will be a smaller balance in the Treasury than last year. The disbursements are about one hundred and fifty dollars greater during the past calendar year than during the 1925–1926 period. Estimating the current liabilities from last year's there will probably be an unexpended balance of one hundred and fifty dollars in the Treasury to last until the next collection of membership dues.

Respectfully submitted,

A. E. WALLER, *Treasurer.*

Report of the Auditing Committee.

COLUMBUS, OHIO, April 16, 1927.

To the Ohio Academy of Science:

Technically there is nothing here to audit—no bank books, vouchers, receipts, etc. The mathematics presented is correct. The committee recommends that the report when completed be sent to the auditor of the Ohio State University with request that he audit same.

Respectfully submitted,

S. R. WILLIAMS,
F. C. WAITE,
Auditing Committee.

Report of the Executive Committee.

COLUMBUS, OHIO, April 15, 1927.

To the Ohio Academy of Science:

The Executive Committee held three meetings during the year now ending.

The first meeting was held, at the call of the President, on October 23, 1926, at the Faculty Club rooms, Ohio State University, with the President and three members (Shatzer, Waller and Alexander) present. The following items of business were presented, discussed and agreed upon:

1. The action of the President and Secretary in designating Dr. Dayton C. Miller as the representative at the ceremonies commemorating the Centennial of the Western Reserve University at Cleveland was approved.

2. Four nominations to membership in the Academy were approved.

3. The resignation of Prof. Charles H. Skinner from the office of Vice-President of the Physical Sciences Section was accepted.

4. The matter of additional financial support to the Ohio Journal of Science, referred to this committee by the Executive Committee last year (see page 25, Pro. 36th Ann. Meeting), was discussed and it was finally decided to arrange another meeting of the Executive Committee at an early date and to invite the editor and business manager of the

Journal to be present and give the committee a full statement of the needs, proposed plans, etc., of the Journal.

5. That Mrs. Ethel M. Miller be made a member of the Academy without dues and that the action of the President in putting her in charge of all Academy publications be approved.

6. That the actual travelling expenses of the Executive Committee when in attendance at its meetings be paid out of the funds of the Academy.

7. That an intensive campaign for new members be inaugurated at once under the leadership of the Treasurer, Dr. A. E. Waller.

The second meeting of the Committee was held at the hospitable home of President and Mrs. McPherson, 198 Sixteenth Avenue, Columbus, on December 16, 1926, with all members of the committee present and, by invitation, Dr. F. H. Krecker, editor of the *Ohio Journal of Science;* Prof. L. H. Tiffany, business manager of the *Ohio Journal of Science,* and Dr. J. H. Schaffner, a member of the editorial board of the *Journal.* The following matters of business were taken up and disposed of:

1. Five applications for membership in the Academy were presented and approved.

2. Prof. Alpheus W. Smith was unanimously elected Vice-President of the Physical Sciences Section, vice Prof. Charles H. Skinner, resigned.

3. The primary purpose of the meeting was then taken up, namely, the matter of additional financial support from the Academy to the *Ohio Journal of Science.* The editor and the business manager of the *Journal* then presented a detailed financial statement for the years 1921, 1922, 1923, 1924, 1925 and 1926, and concluding with the following general statements:

Summary Statements.

1. During the world war and because of inadequate funds previously, the Journal had accumulated a deficit of nearly $800.00 when the present manager was appointed.

2. That deficit will be decreased to about $600.00 by the end of 1926.

3. Since the printers do not render accounts till the end of the year, and since the University allowance and the Academy dues are paid in advance, we are able to meet one year's bills by the next year's allowances.

4. The balance remaining is uncomfortably small, even if we had the deficit removed.

5. This situation gives no opportunity for expansion on the part of the Journal.

6. Authors must pay for all cuts for articles and this is not required by any other scientific publication.

Doctor Krecker pointed out that the *Journal* was seriously handicapped not only by the deficit that has been running for several years, but by lack of funds with which to expand, and expressed the feeling that in view of the service rendered by the *Journal* to the Academy, the Academy could well increase its support, at least to the extent of 50

cents per member. Professor Schaffner was also of the same opinion and expressed the further belief that many members joined the Academy solely for the *Journal.*

After considerable discussion, pro and con, it was finally voted that the Executive Committee recommend to the Academy at its next annual meeting that the By-Laws (Chapter 1, Section 1) be so amended as to increase the annual dues from $2.00 per annum to $2.50 per annum and that of this amount $1.50 be paid to the *Ohio Journal of Science.*

The third meeting of the committee was held at the Faculty Club rooms, Ohio State University, on January 31, 1927. At this meeting it was voted to accept the invitation of the Ohio State University to hold the next annual meeting of the Academy on its campus and the time for this meeting was fixed as April 15th and 16th, 1927.

It was also unanimously agreed that the Academy could do no better in the way of an invitation speaker than to accept the very generous offer of President McPherson to do what he could to so arrange the series of lectures by Dr. Robert A. Millikan, of California, that the members of the Academy could easily take advantage of them and thus hear from one to three. It was further agreed that effort should be made to secure Dr. J. H. McGregor, of Columbia University, and possibly Dr. C. E. McClung, of the University of Pennsylvania.

Respectfully submitted,

THE EXECUTIVE COMMITTEE,
By W. H. ALEXANDER, *Secretary.*

Report of the Trustees of the Research Fund.

To the Members of the Academy:

Our report this year may be very brief, as we have made no grants and, until yesterday, had received no applications. The funds have been invested and interest accumulations added so that we have a total fund to date of $1,520.41, of which $1,300.00 is invested in bonds and $100.00 in certificate of deposit at interest.

Omitting the invested $1,300.00, the account stands as follows:

Balance from last year	$ 83.91
Interest additions	136.50
Total	$220.41
Invested in Certificate of Deposit	100.00
Balance subject to check	$120.41

Unless grants are made during the year, it will be our policy to invest so as to secure returns on the available funds, but we will be pleased to receive applications or recommendations for appropriate projects.

Respectfully submitted,

HERBERT OSBORN,
EDWARD L. RICE,
GEO. D. HUBBARD,
Trustees.

April 15, 1927.

Report of the Auditing Committee.

To the Ohio Academy of Science:

We find adequate vouchers showing for April 14, 1927, $1,400.00 of invested funds and $120.41 balance in checking account of Trustees of the Research Fund. This is in accord with the report made.

Respectfully submitted,

S. R. Williams,
F. C. Waite,
Auditing Committee.

Report of the Committee on State Parks and Conservation.

(Informal)

Prof. Herbert Osborn, Chairman of the Committee on State Parks and Conservation, made an informal report stating that there had been no meeting of the committee and no formal report could be presented at this time. He stated that in connection with the question of preservation of the forest tracts, which offer perhaps the most promising field for the wider preservation of our native fauna and flora, that he had had a conference with Mr. Secrest, the state forester, and had been assured of his desire to aid in this matter and that he would welcome a special committee of advisers from the Academy to formulate regulations intended to preserve the biological status in the state forests. It is evident that the interests of tourists, picnickers, sportsmen, hunters, foresters and biologists are likely to clash at times and it is desirable to adopt plans for the different forest tracts that will meet the different purposes as fully as possible while providing the utmost security for the native plants and animals they contain.

To provide such a committee of advisers it was moved and voted that the President of the Academy be authorized to appoint a sub-committee of the standing committee on State Parks and Conservation to work with the State Forester in the formulation of regulations for the protection of the plant and animal life of the state forests.

(In compliance with the favorable action of the Academy on the above recommendation, President Benedict, on June 2, 1927, appointed the following sub-committee: Herbert Osborn, E. Lucy Braun and Arthur R. Harper).

Report of the Library Committee.

Columbus, Ohio, April 15, 1927.

To the Ohio Academy of Science:

An accurate account of the accessions to the Academy Library of the past ten years has been secured during the year, and a card catalogue has been nearly completed giving in detail these records. The carrying through of this important work is due to enthusiasm and energy of Mrs. Ethel M. Miller, of the Botany-Zoology Library of the University, with the cooperation of the staff of the General University Library.

In 1917 the Academy voted that a suitable printed plate, to be paid for by the Academy, be put in the books given to the Ohio State University Library, and in its accessions.

The University Library possesses a handsome engraved Gift Book Plate which it would be glad to use in place of the Academy's very simple printed plate. The library will supply the plates and pay for the printing of "The Ohio Academy of Science" on them. The Library Committee of the Academy appreciates and accepts this offer for the Academy.

The sales of Academy publications by Mrs. Miller have been highly satisfactory. A statement of these sales is included in Mrs. Miller's appended report. The Chairman of the Committee has checked these sales and audited Mrs. Miller's books, and finds her accounts to be correct and her books to balance.

Respectfully submitted,

F. O. Grover, *Chairman.*

Report of Mrs. Miller for the Ohio State University Library.

Columbus, Ohio, April 15, 1927.

To the Ohio Academy of Science:

The year that has now passed has been an exceedingly busy and pleasant one. As the exchange work was wholly new to me, it took some time to familiarize myself with the periodicals and with the correspondence of the last ten years.

The card catalog is practically finished for the exchanges of the Academy, but is not yet complete for those that receive only the *Journal of Science.* Appreciation is due to the University Library assistance and the time necessary to do the work.

The sale of publications has gone on as usual, amounting to $69.40 to date. Two sales, totaling $8.50 have been made so recently that payment has not yet been received. The difference between these two sums, namely, $60.90, is ready to be handed to the Treasurer, together with an additional sum of $13.15, a check for which dated December 20, 1923, was found last summer in a filing case in the Botany office. The Treasurer asked me to deposit this check in my account and to hand it to him with the full amount of this year's sales. The interest on the sums deposited from the sales of the Academy Proceedings and Special Papers and the *Ohio Journal of Science* for the last half of 1926 amounted to $1.84. The Treasurer agreed to let this remain on deposit.

The Proceedings of the Thirty-sixth Meeting were received in August and were mailed at once upon receipt of the title pages to 442 members and to 84 exchanges. The Academy publications and the *Ohio Journal of Science* have been sent to twenty-five institutions to fill in their sets of these publications and volumes have been received from thirty-five places to fill in our sets of their publications.

No systematic effort has been made to obtain new exchanges, but 41 have been secured with 34 institutions. Ten of these institutions will receive the Academy Proceedings and Special Papers, five will

receive both the Proceedings and the *Ohio Journal of Science* and to nineteen the *Journal* only will be sent. Eighteen former exchanges have been resumed.

I am hoping that as soon as it is possible to do so, the Academy will publish something in addition to the Proceedings to be used as an exchange and to be sold. It has now been fifteen years since the last Special Paper was published. As long as the Proceedings contain only the business reports of the meetings, practically the only new exchanges that can be secured are similar reports of other organizations. Sets of the Special Papers have been sent in several instances, but it seems only fair to continue to send something in return for a periodical that is being published and sent regularly to the Academy.

The most interesting feature of the work this year has been the correspondence with other institutions, both in this country and in all parts of the world.

Respectfully submitted,

ETHEL M. MILLER,
For Ohio State University Library.

Report of the Committee on the Election of Fellows.

To the Ohio Academy of Science:

A meeting of the Committee on the Election of Fellows was held in the office of the Graduate School, Ohio State University, Columbus, on the evening of April 14, 1927, with a quorum present. Of the candidates nominated and considered, seven received the necessary favorable votes and were declared elected. In accordance with custom, the Fellows will be personally notified, and the list will be published in the Proceedings of this meeting.

Respectfully submitted,

WILLIAM H. ALEXANDER,
Secretary, for the Committee.

Columbus, Ohio, April 16, 1927.

The following is a list of those elected Fellows:

J. HOBART HOSKINS
ARTHUR W. LINDSEY
GARRY CLEVELAND MYERS
A. SOPHIE ROGERS
EDMUND MAUTE SPIEKER
GRACE ANNE STEWART
ALLYN COATS SWINNERTON

Report of the Committee on Membership.

To the Ohio Academy of Science:

Applications, each signed by two members of the Academy, have been received from the following named persons and your committee unanimously recommends their election to membership in the Academy,

said membership to become effective upon the payment of one year's dues, viz.:

Babbitt, Miss Ruth Varie, 325 W. Eighth Ave., Columbus.
Bennett, Miss Mary, 101 N. Center St., Westerville.
Bielstein, Clyde H., Westerville.
Billeson, T. J., Sinking Spring.
Bracken, Miss Dorothy M., 1016 Eighth St., Lorain.
Brant, Arthur M., Lord Hall, O. S. U., Columbus.
Champion, Milton M., Box No. 60, Men's Building, Oberlin.
Chase, Miss Catherine, Baldwin Cottage, Oberlin.
Condrin, J. M., 1890 East 105th St., Cleveland.
Cooley, Luster Manring, Ohio Agricultural Experiment Station, Wooster.
Copeland, Herman A., 64 N. Congress St. (temp.), Athens.
Coyle, Miss Elizabeth E., 360 E. Bowman St., Wooster.
Crum, Carlos L., Sinking Spring, Ohio.
Cuyler, W. Kenneth, Cleveland Museum Natural History, 2717 Euclid Ave., Cleveland.
Dunham, W. E., Ohio State University, Columbus.
Easterling, G. R., R. F. D. No. 4, Athens.
Edwards, Ray Lee, Physics Department, Miami University, Oxford.
Engle, O. H., 122 Rice St., Alliance.
Fearing, Franklin, Ohio Wesleyan University, Delaware.
Fields, Paul E., Delaware.
Fitzgerald, Paul E., Harrod, Auglaize County.
Fletcher, Fred, Miami University, Oxford.
Fulford, Miss Margaret, Sutton Ave., Mt. Washington, Cincinnati.
Gans, Dr. Howard M., 1067 Thornhill Drive, Cleveland.
Hale, Dr. Kelly, Wilmington.
Hansen, Walter, 190 E. College St., Oberlin.
Harrod, J. R., 213 E. University Ave., Ada.
Haynes, John, 33 W. Eleventh Ave., Columbus.
Hedrick, Joyce, 13 Bishop Hall, Oxford.
Hertz, Mrs. Marguerite R., 9511 Lamont Ave., Cleveland.
Holsopple, Dr. Quinter, Western Reserve University, Cleveland.
Kayser, William, 211 W. Mechanic St., Wapakoneta.
Keplinger, Mrs. Dorothea Doane, 3147 W. 88th St., Cleveland.
Kilpatrick, Beth, R. F. D. No. 3, Athens.
Kirk, Joseph M., 16 E. Broad St., Columbus.
Leikind, Morris C., 417 S. Monroe St., Columbus.
Liming, O. Neal, 231 S. Charity St., Bethel.
Lippy, Miss Grace E., 835 Woodlawn Ave., Springfield.
McCaughey, Wm. J., Dept. of Mineralogy, O. S. U., Columbus.
McClure, O. E., 182 N. Congress St., Athens.
McGilliard, Miss Eleanor, 10 Parkway, Hartwell, (Cincinnati).
McMurray, W. J., 201 Court St., Wapakoneta.
McNelly, Walter C., 230 E. Church St., Oxford.
Meyers, Marion T., Dept. of Farm Crops, O. S. U., Columbus.
Miller, Joseph N., Department of Zoology, O. S. U., Columbus.
Moore, George M., King Hall, Westerville.
Munson, Arthur L., 2914 E. 132d St., Cleveland.
Neiswander, Ralph B., 26 W. Frambes Ave., Columbus.
O'Rourke, Edward V., Department of Mine Engineering, O. S. U., Columbus.
Odiorne, Joseph M., Biological Laboratory, Western Reserve Univ., Cleveland.
Ohmann, Dr. O. A., Dept. of Psychology, Western Reserve Univ., Cleveland.
Park J. B., Ohio State University, Farm Crops, Columbus.
Peele, Miles T., Wilmington, Ohio, (Temp. 1548 Michigan Ave., Columbus).
Pittenger, William J., 1008 Moeller Ave., Akron.
Porter, James P., Ohio University, Athens.
Rickly, Irvin B., 2063½ N. High St., Columbus.
Rilling, Miss Pauline B., 920 S. Fourteenth St., New Castle, Ind.
Schaefer, J. E., 383 Oakland Park Ave., Columbus.
Schaeffer, John W., 16 E. Broad St., Columbus.

SCHNEIDER, MISS ELIZABETH, 514 N. Wittenberg Ave., Springfield.
SIMMONS, GEORGE FINLAY, Cleveland Museum Natural History, Cleveland.
SLEESMAN, J. P., 128 W. Lane Ave., Columbus.
SMITH, G. L., 618 S. Main St., Ada.
SNIDER, GEORGE GOULD, Dept. of Zoology, University of Cincinnati, Cincinnati.
VAUGHN, LLOYD D., R. F. D. No. 1, Carrothers.
WALKER, CHARLES F., 53 Latta Ave., Columbus.
WEBSTER, CHARLOTTE E., 300 Washington Ave., Elyria.
WILLIAMSON, ERNEST W., Belfast, Ohio.
YOUNG, BOYD B., 1104 Garfield Ave., Springfield.

Respectfully submitted,

GEORGE D. HUBBARD, Chairman,
W. H. SHIDELER,
Committee.

Unanimously approved.

Report of the Nominating Committee.

President—HARRY M. BENEDICT.
Vice-Presidents:
Zoology—ARTHUR W. LINDSEY.
Botany—HOMER C. SAMPSON.
Geology—ALLYN C. SWINNERTON.
Medical Sciences—EMERY R. HAYHURST.
Psychology—A. SOPHIE ROGERS.
Physical Sciences—ALPHEUS W. SMITH.
Secretary—WILLIAM H. ALEXANDER.
Treasurer—A. E. WALLER.
Elective Members of Executive Committee—L. G. WESTGATE, L. B. WALTON.
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Respectfully submitted,

S. R. WILLIAMS, *Chairman*,
R. J. SEYMOUR,
C. F. MOSES,
M. E. STICKNEY,
W. H. ALEXANDER.

Columbus, Ohio, April 16, 1927.

Report unanimously approved.

Report of the Committee on Necrology.

To the Ohio Academy of Science:

So far as known to your committee, the Academy has suffered the loss through death of but one member during the year just ended, namely, Prof. Edwin A. Hartley, of the New York State College of

Forestry. The following notes concerning the life and work of Professor Hartley were supplied by Dr. Herbert Osborn, of the Ohio State University:

EDWIN A. HARTLEY.

Our Academy has lost one of its very promising members in the death of Professor Edwin A. Hartley, of the New York State Forestry School, Syracuse University, Syracuse, New York. Professor Hartley died from an acute attack of appendicitis, October 15, 1926, at the age of thirty-three. He was formerly a resident of Oregon and studied at the Oregon Agricultural College, receiving his Bachelor of Science degree there in 1918. During his college career and for some time later he was employed in forestry work by the State of Oregon and the United States Forestry service. He entered Ohio State University in the fall of 1919, taking the graduate work in Entomology and serving as a graduate assistant, remaining in this position for two years, during which time he made an important study of parasitic Hymenoptera, and obtaining his Master of Science degree in 1921. He was engaged as an Entomologist for some time later in the Pennsylvania Bureau of Plant Industry, but in 1922 was elected to the position of Assistant Professor of Entomology in the Syracuse Forestry School, where he continued until the time of his death.

Professor Hartley was a man of very fine personality, a man who made a host of friends and who was very highly esteemed by all of his associates. He was an industrious, energetic student, quick to comprehend, resourceful in ideas, and the kind of student who is a satisfaction and pleasure to his instructors. It was during his connection in the Ohio State University that he became a member of the Ohio Academy of Science and this membership he has retained in his various positions since leaving the state. Aside from his membership in the Ohio Academy of Science, he was a member of a number of scientific associations, among them, the Sigma Xi, The American Association of Economic Entomologists, and the Entomological Society of America.

Respectfully submitted,

L. B. WALTON,
Committee.

Report of the Committee on Resolutions.

Resolved, That the Ohio Academy of Science expresses its thanks—

1. To the Columbus Chamber of Commerce for its cooperation in making this meeting a success by providing two clerks to take care of the registration of members, the sale of banquet tickets, the giving out of information, etc.

2. To the local committee for making such ample and adequate arrangements for this meeting.

3. To the Ohio State University for the use of its buildings and equipments.

4. To the Graduate School of the Ohio State University for making it possible for the members of the Academy to hear Dr. C. E. McClung and Dr. R. A. Millikan.

Respectfully submitted,

E. L. MOSELEY,
W. F. MERCER,
H. M. BENEDICT,
Committee.

Columbus, Ohio, April 16, 1927.

Scientific Sessions.

The following is the complete scientific program of the meeting:

PUBLIC LECTURES.

The Mechanism of Heredity.....Dr. C. E. McClung
The Birth of a Light Ray.....Dr. R. A. Millikan
Cosmic Rays.....Dr. R. A. Millikan

PAPERS.

1. The physiological gradient and its relation to morphology.....W. H. Camp
2. Science for non-scientists.....David Dietz
3. The primary plant associations of Ohio: Their distribution and their significance as habitat indices.....Homer C. Sampson
4. Recent studies of the American eagle.....Francis H. Herrick
5. Sex and sex-determination in the light of observations and experiments on diecious plants.....John H. Schaffner
6. The present status of Entomology as an applied biological science, D. M. DeLong
7. The place of human biology in the college curriculum.....A. B. Plowman
8. The apparent need for an elementary cytology course for undergraduate students of zoology and biology.....Walter C. Kraatz
9. Some of the more recent conceptions concerning the supporting tissue of the nervous system.....Ernest Scott and Robert A. Moore
10. A greatly increased range of usefulness for the Leeds and Northrup multiple fixed value standard of self inductance.....R. L. Edwards
11. The Dr. B. R. Bales Collection of birds eggs.....James S. Hine
12. The tracheal stalk as supports of the female copulatory organs of the Polydesmid millepedes.....S. R. Williams
13. The male Trichopetalum lunatum—Harger; one of the Milliped family, Chordeumidæ.....R. A. Hefner
14. Linkage studies in Drosophila hydei.....Warren P. Spencer
15. A survey of State fish hatcheries to determine the damage due to parasites.....Ralph V. Bangham
16. The automobile as a factor in the destruction of wild life.....Lynds Jones
17. Relation of light to the attachment of sessile marine organisms with special reference to those causing fouling of ships' bottoms, J. Paul Visscher
18. A revisit to Carrol Island, Washington, after twenty years.....Lynds Jones
19. The sensory hairs of Tyroglyphus americanus—Banks.....Bierly Landis
20. Quantitative tests of the "poison gas" of certain Millipedes..Fred Fletcher
21. The red bat as a mother.....E. L. Moseley
22. Catalase activity and sex.....W. H. Camp
23. The Sporophylls of Onoclea sensibilis.....Maximilian Braam
24. Structure of some Pennsylvanian plants from Illinois.....J. Hobart Hoskins
25. The inheritance of Brown Pericarp in maize.....Marion T. Meyers
26. Relic colonies and their significance in the plant migrations of Ohio, E. Lucy Braun
27. Seasonal variations in the physical properties of evergreen leaves, Bernard S. Meyer
28. Further studies on Hibernacula in aquatic plants.....H. H. M. Bowman
29. Life history and experimental study of soybeans.....H. L. Borst
30. A rational formula for the photosynthetic reaction.....R. B. Gordon
31. Control of sex-reversion in the tassel of Indian corn.....J. H. Schaffner
32. Some hypertrophic developments of aerial organs when used as cuttings, O. T. Wilson
33. Rapidity of sap rise in ten species of trees as calculated on the basis of Bose's theory.....H. M. Benedict
34. The Graphidaceæ of North America.....Bruce Fink

35. Note on the relation of stem size to leaf number in Ailanthus..H. M. Benedict
36. Preliminary studies of Ascophyta and related forms on herbaceous legumes.....Roderick Sprague
(Introduced by H. M. Benedict)
37. The winter blooming of dandelions.....Bruce Fink
38. The Arthoniacaæ.....Miss Joyce Hedrick
(Introduced by Bruce Fink)
39. The genus Hypoxylon in Ohio.....Don Creager
(Introduced by Bruce Fink)
40. The withering of flower-stalks.....Miss Eleanor McGilliard
(Introduced by H. M. Benedict)
41. Waste in clay mining in Ohio.....H. E. Nold
42. The use of X-rays in mineral investigation.....William J. McCaughey
43. South America as a future producer of crude petroleum.....E. V. O'Rourke
44. The oil yield of samples of Ohio shale from Adams County,
Walter H. Bucher
45. Sponge spicules from the Sunbury shale.....Walter H. Bucher
46. Geology as a factor in soil classification in the New England States,
G. W. Conrey
47. Geology of Fort Ancient and Oregonia region, Warren County, Ohio,
J. J. Wolford
48. Grading of crude petroleum.....E. F. Clagett
49. Geologic section from the Adirondacks to the Green Mountains across the Champlain Valley near Ticonderoga.....A. C. Swinnerton
50. Relation of glauconite to unconformities.....J. E. Schaefer
51. Geological library facilities in Ohio.....Gen. Edward Orton, Jr.
52. Unveiling of potraits.
(a) W. W. Mather—Remarks by.....J. A. Bownocker
(b) Edward Orton—Remarks by.....A. F. Foerste
53. Nature of geologic seas.....Geo. D. Hubbard
54. Recent discoveries of Ordovician fossils of Richmond age in northwestern Greenland, and their bearing on the problem of climate in early Paleozoic times.....A. F. Foerste
55. The economic importance of joints.....Chas. H. Behre, Jr.
56. Recent studies on early American Chepalopods, and their bearing on the problem of the origin and evolution of Chepalopods.....A. F. Foerste
57. Olentangy shale in southern Ohio.....R. E. Lamborn
58. Fossil footprints from the Pennsylvania System in Ohio.....J. E. Carman
59. Further data on old drainage in northeastern Ohio with some implications,
G. F. Lamb
60. A short description of the Millersburg oil and gas pool.....R. W. Melhorn
61. A comparison of the age with the number of somites in the white rat,
F. L. Landacre and H. M. Amstutz
62. The Spermatocytes of the first order in Branchipus vernalis,
R. C. Baker and C. A. Rosof
(Introduced by F. L. Landacre)
63. The effect of the amount of protein in the previous diet and the nitrogen excretion of the Albino rat during a fast,
F. A. Hitchcock and A. L. Rawlins
64. Silicosis; An X-ray study of 919 Ohio quarrymen (Stereo-Roentgenological demonstration).....Danial J. Kindel and Emery R. Hayhurst
65. Why the death rate for Columbus is higher than that for Toledo: A statistical study.....Ruth E. Moore and Emery R. Hayhurst
66. Deaths from heart disease in Ohio, with recommendations for the City of Columbus: A statistical study.....Emery R. Hayhurst
67. Lethal character of various vapors in confined spaces (rat demonstration),
Fred Berry and Emery R. Hayhurst
68. Blood pressure in the rat.....Rollin R. Durant
69. The prisms and interprismatic substance of the dental enamel,
Samuel W. Chase
70. Some physico-chemical conditions necessary for light production by luminous bacteria. (See demonstration No. 8).....O. L. Inman

71. The breathing of combustion products in relation to pneumonia: An experimental study with white rats.....EMERY R. HAYHURST
72. Form perception in the white rat.....PAUL FIELDS
73. Muscular conditions in the after-image in reading.....CARL N. REXROAD
74. Diagnosis and remedial instruction in reading.....LUELLA C. PRESSEY
75. Psychological attributes of hysteria in children.....FLORENCE MATEER
76. Advantages of various gross score formulæ and checking formulæ in statistical computation.....HERBERT A. TOOPS
77. Analysis and treatment of rage in a two-year-old child, MRS. MARGUERITE R. HERTZ
78. Classroom fears of junior high school pupils....MRS. HARRIET C. KEPLINGER
79. A study of the vocational interests of college women.....O. A. OHMANN
80. A preliminary report on the technique of semi-circular canal extirpation in pigeons together with a tentative statement of results in connection with the recovery of equilibratory functions.....FRANKLIN FEARING
81. A study on the causes and treatment of rage.....MRS. DAVID RALPH HERTZ

DEMONSTRATIONS AND EXHIBITS.

1. An improvised metal cannula.....ROLLIN R. DURANT
2. A new apparatus for the measurement of the psycho-galvanic reflex, S. R. HATHAWAY
3. The wild flowers of Ohio.....WILLIAM KAYSER
4. Map showing distribution of the vegetation of Ohio, E. N. TRANSEAU AND H. C. SAMPSON
5. Some new mutants in Drosophila funebris and D. hydei..WARREN P. SPENCER
6. Phomicrographs to illustrate paper No. 9, Medical Sciences Section, SAMUEL W. CHASE
7. Polychaete ancestry of the insects. Illustrations from unpublished proof of the American Naturalist.....L. B. WALTON
8. Cultures of luminous bacteria. (Dark room).....O. L. INMAN
9. Cleating and jointing in rocks.....CHAS. H. BEHRE, JR.

SPERMATOGENESIS IN BRANCHIPUS VERNALIS.

Part I.

THE TESTIS AND SPERMATOGONIAL DIVISIONS.

R. C. BAKER AND J. A. ROSOF,
Department of Anatomy, Ohio State University

Maturation in Branchipus has not apparently been studied since Fries' work on oogenesis in 1910. Concerning either the general or the detailed processes of maturation that should be basic for certain embryological studies, Branchipus furnishes excellent laboratory material for the following reasons:

(1) It is easily available and has a rather wide distribution.

(2) The mitotic figures illustrating the various stages of maturation are extremely numerous.

The important researches and theoretical postulates produced during the last quarter of the 19th century in the field of Cytology, initiated a series of investigations which resulted in the apparent demonstration of the genetic continuity of chromosomes and their role in heredity.

The discovery of reduction in animals by Van Beneden (1883), and reduction in plants by Strassbouger (1888), coupled with Roux' (1883), statement that chromatin has qualitative differences and that these different qualities are arranged in linear order in the chromosomes, together with Weismans (1887), speculative but fruitful analysis of reduction served as a beginning for the efforts that cytologists have made in the study of reduction.

In the early part of the 20th century the individuality and relationships of chromosomes to heredity was placed on a firmer basis by (Sutton, Montgomery, Wilson, McClung, Welling, Morgan, their students and others). An enormous amount of work has been done, and much as been accomplished toward the first solution of the problem and the main features of the steps involved in reduction of chromosomes has been established. Yet, however, there is some disagreement among cytologists as to the exact method and mechanism of reduction.

This divergence of opinion is greatest in the interpretation of the changes that occur in the chromatin during the early prophase of the meiotic division, for it is at this time that chromosomes conjugate to form bivalent chromosomes. That this conjugation of chromosomes is brought about by a synapsis of homologous pairs of chromosomes is a fact unquestioned by most cytologists today. However, the mechanism and mode of synapse is not too clearly described in any of the evidences produced to prove synapsis of chromosomes. The two views regarding the nature of synapse are, conjugation of chromosomes side by side (parasynapsis) and end to end conjugation (telosynapsis).

The theory of parasynapsis predominates at the present time, although those workers holding to the telosynaptic viewpoint are many in number. This difference in interpretation is due to the difficulty of following chromosome behavior in the early prophase stages preceding the synaptic period, for at this time the chromatin masses are very indistinct in most forms.

It is the purpose of this series of papers to give observations covering the spermatogensis of Branchipus vernalis with special emphasis on the mode of synapse, bouquet formation, chromosomal transformations and formation of spermatozoan chromosome figures.

The material on which this paper No. 1, Spermatogonia, and ensuing articles, No. 2, Primary Spermatocyte, and No. 3, Secondary Spermatocyte, Spermatid and Spermatazoa, are based, was collected from ponds during March and early April, and was identified as Branchipus vernalis. This material was fixed in absolute alcohol seven parts, and glacial acetic acid two parts from three and a half to four hours; then washed in four or five changes of absolute alcohol twenty four hours. Only part of the specimen containing the testes was imbedded. Sections were cut five to seven microns in thickness and stained with Heidenhain's haematoxylin. Prior to fixation it is well to keep the specimen in water from twenty-four to thirty-six hours in order that the digestive tract may be freed from silicon.

Acknowledgment of thanks is made to Dr. F. L. Landacre for advice and criticism, and to the Graduate School for financial aid in the reproduction of plates.

The Spermatogenesis of Branchipus.

A series of longitudinal sections reveal the testes as paired tublar structures on each side of the digestive tract. They extend from the most caudal portion of the abdomen anteriorly to the thoracic region. A study of a longitudinal section shows that a division of the testis into two parts can be made. (1) The anterior one-fourth or glandular portion and, (2), the posterior three-fourths or germinal portion. Histologically, these two regions are markedly different. The former is characterized by tall, darkly staining columnar cells and the latter by flattened or compressed cells, which form the wall of the tubule. From the ventral side of the testis at the anterior end, the gonoduct is attached. This duct which is glandular in structure, courses ventrally and caudally terminating in the copulatory organ.

The glandular part of the testis secretes a mucoid-like substance which has a vacuolated appearance and stains quite readily. This substance fills the lumen and in it spermatids and spermatoza are found imbedded in great numbers. The secretion is not confined altogether to the anterior region of the testis but is more abundant there and stains more deeply at that particular region. The germinal part of the testis is concerned in the process of transformation of the basal cells or spermatogonia into the mature free ameboid spermatozoa which are found imbedded in the mucoid material in the lumen of the tubule. The more immature cells are located along the basal part of the tubule and are for the most part spermatogonia. These cells divide and differentiate into more mature forms as they pass from the periphery toward the lumen of the tubule.

A typical cross section of the germinal part of the testicular tubules reveals that each tubule is composed of cells arranged in cysts, (Fig. 14). These cysts vary considerably in number, appearance, location and in the number of cells contained within them. Each of these cysts contain cells which are apparently in the same stage of development. The cysts located more basally contain spermatogonia while those cysts which are nearer the lumen of the tubules contain more differentiated types of cells; some of the cysts contain spermatocytes of the second order, while others contain spermatids or spermatozoa. The cysts containing spermatogonia are large and are the least apparent type. In some cases they are hardly

recognizable as cysts, but usually they are distinguishable. The cysts containing the more differentiated succeeding cellular generations are well defined, smaller, and contain fewer cells.

The inner wall of the tubule lining the lumen is apparently a definite membrane which ruptures at the time of the discharge of the spermatid and spermatozoa into the lumen, leaving an irregular torn area which soon resumes its former condition by the placing of another cyst in the position occupied by the discharged cells.

The lumen of the tubule contains the spermatids and the ameboid spermatozoa which are imbedded in the mucoid-like substance previously mentioned. It is apparent that some of these cells have migrated or have been carried into their present position from a position farther up the tubule.

Superimposed upon the cysts located at the more basal portion of the testicular tubules are a number of very large cells unevenly distributed through the entire germinal portion of the testes. These are Giant cells which are from two to four times the diameter of the ordinary spermatogonia. The cells take a darker stain than do the surrounding ones, and they vary in shape from that of an imperfect sphere to that of an elongated oval form. There is no definite nucleus within these cells, but instead the chromatin is aggregated into several large irregular clumps and many small granules. The larger masses of chromatin have no definite relationship to each other, but are scattered throughout the cells in an irregular manner. Occasionally tripolar spindles are found in these cells. The significance of these cells is uncertain but it is surmised that they are degenerate sex cells. The inference that these cells are degenerate sex cells rather than nurse cells is drawn from the fact that the chromatin is undergoing degeneration and that the cells have no definite relationship to the developing spermatids and spermatozoa.

The examination of a series of sections through the germinal portion of the testis shows an apparent periodity of function similar to that of the testes of higher forms. This is evidenced by the differences in the cellular content of the germinal portion of the tubules of the testes. As the sections are read consecutively, from one extremity to the other it is noticed that as the more differentiated cells increase in number that the spermatogonia show a corresponding decrease. There are typical regional areas where there is an increase in cellular proliferation.

These regions are separated by portions of the tubules in which there is marked quiescence. The entire picture of this type of tube simulates a wave-like character in which the crest of the wave is the thicker portions of the tubule containing a large number of dividing spermatogonia and primary spermatocytes. There are relatively few mature spermatozoa in this part. The more inactive portions of the tubules between these crests are thin walled containing few spermatogonia and practically no cellular division. The lumen of this part of the tubule is usually packed with spermatozoa.

Spermatogonia.

The spermatogonia of Branchipus are located along the periphery of the germinal portion of the tubule throughout its entire extent. The cysts containing the spermatogonia are most apparent and best defined in the regions of more active proliferations. In more inactive regions of the tubule the spermatogonial cysts are not discernible. Instead the cells are arranged in ill defined rows which vary in number from that of a single row to several rows. In the region of activity the cysts are usually large and ill defined but they are nevertheless discernible as cysts. This condition is due to the large number of cells contained within the cysts, the large size of the cysts and the distortion of the boundary of the cysts by the impingement exerted upon them by neighboring cysts which contain cells actively differentiating. The smaller and better defined spermatogonial cysts contain fewer cells which not being closely packed, permits of better inspection of the contained cells since the cells are separated and their contours not distorted by neighboring cells. On the other hand the large and crowed cysts contain cells which are closely packed together and it is only with difficulty that individual cells are recognizable. These cysts are more numerous.

A good criterion for the identification of spermatogonia aside from what has been previously stated is their staining properties. The spermatogonia stain readily and as a result they are darker than the other cellular contents of the testis. The cells other than the spermatogonia and Giant cells have a clear background, the cytoplasm and nucleus appear almost colorless except for the elements that are stained black by the hematoxylin. The spermatogonial cytoplasm and nucleus possess a grey background when colored with this stain. This

greyness of background is quite characteristic in all spermatogonial stages, whether the cells be in resting condition or actively dividing.

The nucleus which occupies almost the entire cell is surrounded by a very narrow rim of grey protoplasm. If the cells are closely crowed then the cytoplasm being compressed appears small in amount. The shape of the nucleus is spherical but at times it may reveal slight variations. The size of the nucleus is not constant. During the resting condition and early prophase, the nucleus is small, being a little larger than one-half the size of a primary spermatocyte. However, the distinction between the spermatogonia and primary spermatocytes are easily made since the nucleus of the former is smaller during early stages and has a different chromatin arrangement in later stages. In addition to this, there is a marked contrast in staining reaction which has been previously stated.

The following description of the behavior of the chromatin in the nucleus of the spermatogonium in Branchipus is based upon the study in the transformation of the chromatin in a large series of sections.

A typical spermatogonium in the resting stage reveals the chromatin rather evenly scattered throughout the nucleus with the exception of two or more larger, irregular aggregates. The other chromatin particles vary in size from almost indistinct granules to masses as prominent as the large ones. The chromatin varies in staining properties, some of the granules staining more faintly than others. The nuclear wall is very evident. The cell as well as the contained nucleus is small and somewhat spherical in contour. The size of the resting cell, (Fig. 1) is smaller than any of the ensuing stages. There are only a comparatively few cells in this stage. The chromatin of the nuclei of most of the cells is in the form of different sized aggregates connected with each other by strands exhibiting various degrees of attenuation as the following description reveals.

Gradual changes are seen in the nuclei during the early prophase which results in the formation of definite chromosomes, (Figs. 2, 3, 4, and 5). The first change that is noted is a beginning of a reticulum. This recticulum becomes apparent when the chromatin condenses in certain areas resulting in the formation of larger and fewer aggregates, (Figs. 2 and 3.) The strands which form this reticulum vary in size and form and

are oriented in an indefinite manner. Sometimes, they are long and attenuated— or they may be short and heavy. The chromatin aggregates also show these indefinite characteristics. It is apparent by the inspection of Figures 2, 3, and 4, that the size of the nucleus has increased, and the nuclear membrane is very distinct.

A further change of the chromatin mass continues. The strands of the reticulum contract and separate in certain regions, gradually condensing in an irregular fashion, and form indefinite chromosomes, (Fig. 5). This is the condition of the cells in the majority of the spermatogonial cysts. So numerous are the cells in these cysts that it is only with difficulty that individual cell boundaries are discernible.

The indefinite chromosomes of this phase of development now change in shape and form definitive chromosomes, (Fig. 6). In reference to this figure the remaining attenuated chromatin strands have entirely disappeared. These definite chromosomes are formed by the chromatin becoming equalized in thickness throughout. At this time, homologous chromosomes cannot be identified due to their similarity and their crowded condition. The nuclear membrane disappears and at the same time there is a decrease in the staining property of the cytoplasm resulting in an almost clear background for the late prophase.

By further contraction the individual chromosomes assume their characteristic size and shape, (Figs. 7 and 8). It is quite usual in this stage of development to find individual chromosomes rather equally distributed throughout the cytoplasm of the cell. On account of this scattered condition and the clearness of cytoplasm, these cells are particularly favorable for determining chromosome counts, and relations of individual chromosomes, (Figs. 7, 8, and 9).

There are twenty-three chromosomes in the spermatogonium of Branchipus. There is little difficulty in distinguishing homologous pairs, and the accessory chromosome. Figure 13 shows individual chromosomes taken from the cell illustrated in Fig. 7. By reference to Fig. 13, the chromosomes which are arranged according to their similarity, the differences between the unlike chromosomes can be observed. Arranging chromosomes in this manner enables one to detect homologous chromosomes. There are eleven pairs of chromosomes and one chromosome which has no mate (chromosomes of Figs. 7, 8, and 13).

In Figs. 7 and 8, there are some homologous chromosomes which are already paired. Chromosomes D, E, and F, are paired while chromosomes L are in close relationship with each other, (Fig. 7). In Fig. 8, this same condition is observable in three pairs of chromosomes although the chromosomes which revealed a paired condition in Fig. 7, are not all paired in Fig. 8. The only chromosomes paired in both cells are chromosomes F. The fact that the same pairs of homologous chromosomes are not found associated together in every case indicates that this is more of a chance occurrence than the regular procedure in the activity of chromosomes. A significant fact of this association is that the chromosomes involved in individual pairings have the same morphological characteristics.

Following the stage just described, the chromosomes continue to contract and change in shape until they become more or less rounded. At this time, the chromosomes are going on the spindle in preparation of the ensuing division. Fig. 9, shows a polar view of the chromosomes on the spindle. (In this figure there are three enlarged and poorly fixed chromosomes). Chromosomes in the metaphase stage arranged on the spindle are seen in Fig. 10. Here separate chromosomes are observable, but no distinguishable characteristics mark individual chromosomes.

A slightly later stage is represented in Fig. 11. The chromosomes of this particular stage are proceeding to their respective poles. In reference to this figure, two chromosomes which are separated from the main mass of chromosomes are seen. These are the divided accessory chromosomes. The accessory chromosome is not always detached from the main mass of chromatin, for frequently, cells can be found showing no isolated, dividing X chromosome. As the chromosomes near their respective poles, individual chromosomes are no longer distinguishable, but instead they are crowed into a dense mass whose concavity is directed centrally.

Not many anaphase and telaphase figures are found. This indicates that the process of division progresses with rapidity in these particular stages. The daughter cells of the spermatogonial division either differentiate into a primary spermatocyte or form other spermatogonia.

Conclusion.

(1) The testes of Branchipus is divided into two parts:
   1. the anterior one fourth or glandular portion, and,
   2. the posterior three fourths or germinal portion.

(2) The germinal cells are arranged in cysts.

(3) There is a periodicity of function of the testicular tubules as is evidenced by the wave-like areas of cellular proliferation and quiescence.

(4) There are twenty-three chromosomes in the spermatogonium of Branchipus vernalis.

(5) There is one accessory and eleven pairs of homologous chromosomes.

(6) In the late prophase some homologous chromosomes become paired. This pairing is more of a chance occurrence rather than the regular behavior in the activity of chromosomes.

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EXPLANATION OF PLATE I.

These Figures were made by aid of camera lucida at a magnification of 1250×.

Fig. 1. A resting spermatogonial cell.

Fig. 2. An early prophase stage showing the beginning of a reticulum.

Fig. 3. A less apparent reticulum with the chromatin condensed in areas of the reticulum.

Fig. 4. Shows the strands of reticulum thickened and separated in some regions. The large mass located centrally represents several condensations of chromatin closely approximated.

Fig. 5. Shows the formation of indefinite and irregular chromosomes.

Fig. 6. Late prophase; the nuclear membrane has disappeared and definitive chromosomes are present.

Fig. 7. The well defined chromosomes show their characteristic size and shape. Homologous pairs are distinguishable and a chromosome count is easily made. Letters E, D, and F, refer to the paired chromosomes. L indicates two homologous chromosomes closely approximated but not paired, X is the accessory chromosome. (See Figure 13).

Fig. 8. Another cell similar to Figure 7. F indicates homologous chromosomes which are paired. The same chromosomes are paired in Fig. 7. X is the accessory chromosome.

Fig. 9. A polar view of 23 separate chromosomes.

Fig. 10. Early metaphase stage.

Fig. 11. Anaphase stage showing the X chromosome divided and separated from the main chromatin masses.

Fig. 12. Shows chromosomes approaching their respective poles.

Fig. 13. Shows chromosomes of Fig. 7, arranged according to morphological similiarities. The legend of Figure 7 is the same as that of Figure 13.

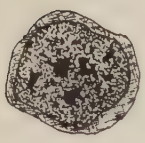

Fig. 1

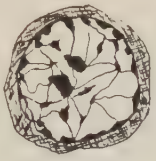

Fig. 2

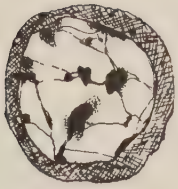

Fig. 3

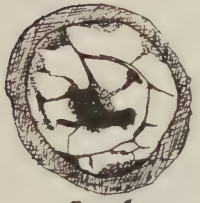

Fig. 4

Fig. 5

Fig. 6

Fig. 7.

Fig. 8

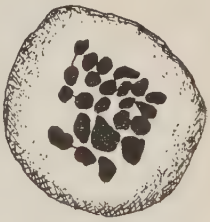

Fig. 9.

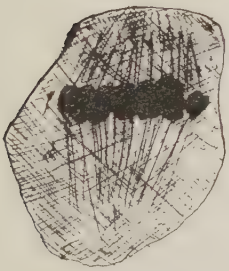

Fig. 10.

Fig. 11.

Fig. 12.

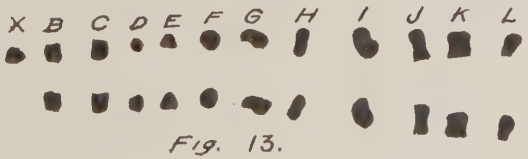

Fig. 13.

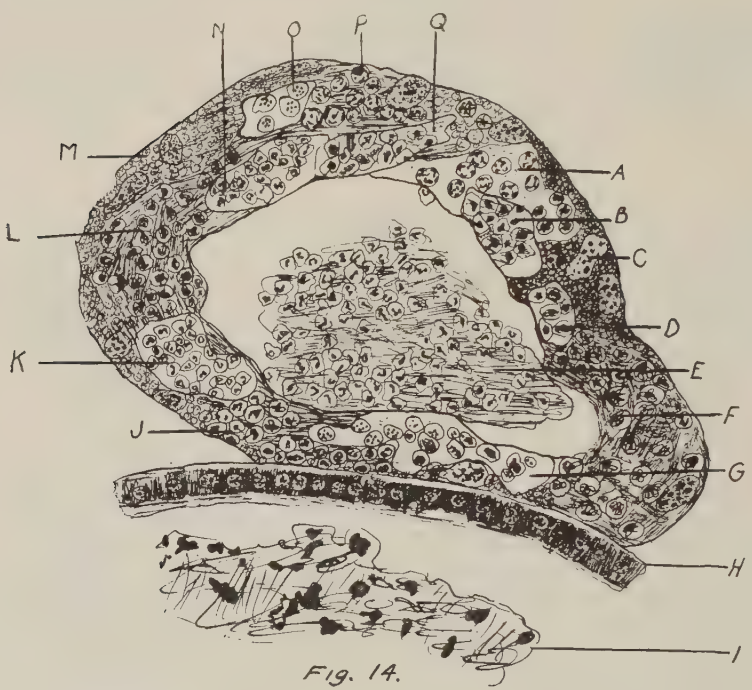

Fig. 14. A camera lucida drawing of a cross section through the germinal portion of a testicular tube × 250, reduced to 125.

A. A cyst of primary spermatocytes in diaknesis.
B. A cyst of dividing primary spermatocytes.
C. A giant cell.
D. Cyst of dividing primary spermatocytes.
E. Spermatids and spermatozoa imbedded in the mucoid substance in the lumen.
F. Primary spermatocytes in bouquet stage.
G. Stages of primary spermatocyte similar to B and D.
H. Wall of intestine.
I. Intestinal contents.
J. Primary spermatocytes in synizesis.
K. A cyst containing a few spermatids and numerous spermatozoa.
L. A cyst of primary spermatocytes emerging from synizesis.
M. Resting spermatogonia.
N. A cyst containing few spermatozoa and numerous spermatids.
O. Primary spermatocytes showing chromosomes going on the spindle.
P. Primary spermatocytes previous to diaknesis.
Q. Dividing secondary spermatocytes.

THE PLACE OF THE NATIVE PERSIMMON IN NATURE.

In Relation to Other Plant Communities and to Certain Economic Insects.*†

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Introduction.

The economic value of the native persimmon, *Diospyros virginiana* L., is limited although it finds uses in several different ways. Its real values are in the ebony-like character of its wood, in the nectar produced by the flowers and in the stock it supplies for Japanese persimmon grafting scions. Some mistletoe is collected from the larger trees and sold during the holiday season. The greatest potential value is undoubtedly in the undeveloped and non-commercialized fruits.

The wood is used where a very hard material is necessary as in shuttles, golf stick heads and plane stocks. When the timber was cut along the railroads in the Carolinas large amounts of this wood were used in the mills. The use in recent years, however, is much less, not because it is not as valuable and could not be used in many more ways than formerly, but because of the sub-dominant position it has in nature which limits the supply so that milling for it is not profitable.

A very fine quality of honey is made from the nectar produced by the flowers. It has been rated as the fourth plant in the quantity of nectar produced in the Coastal and Peidmont Sections of North Carolina and probably ranks about the same in South Carolina. In the Mountain Section it is less common but still is one of the important nectar producing plants.

The native persimmon is the common stock now used for grafting of the Japanese persimmon scions. The small seedlings which grow almost everywhere supply an abundance of material for this use.

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*A portion of this study was made when the writer was located at N. C. State College and the remainder since going to Clemson College, S. C.

†Contribution 91, from the Department of Zoology and Entomology, Ohio State University.

It is not generally known that the food value of the fruit is next to that of the date and that the flavor of the ripe non-astringent varieties is very excellent. The fruit is used chiefly by negroes, hogs and opossums. The prejudice against the astringent and unripe fruit seems to be extended to all the varieties and even to the Japanese persimmons.

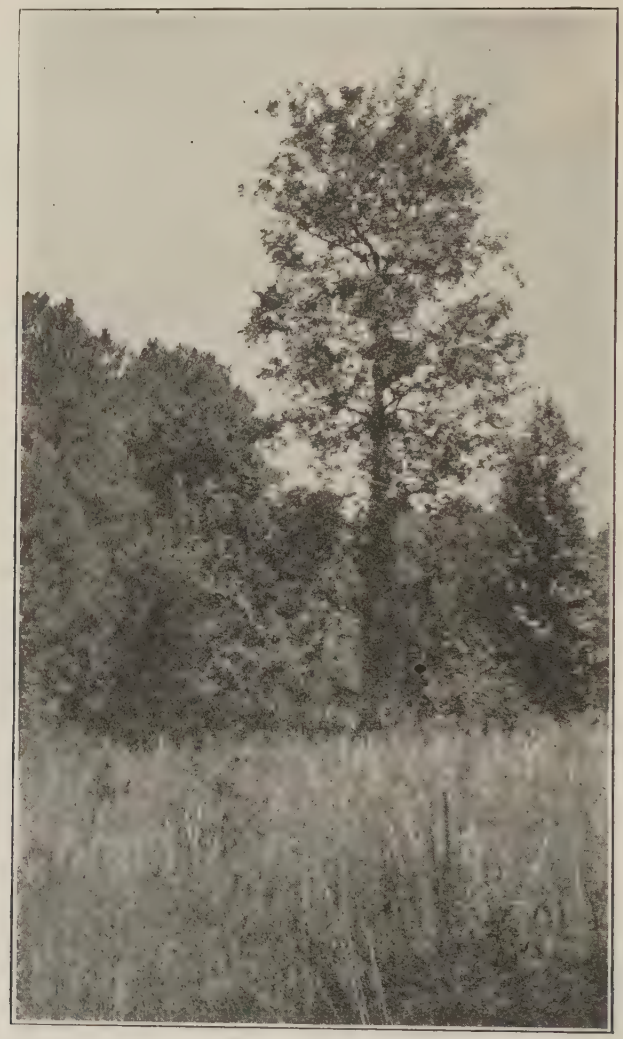

FIGURE 1

Relation to Other Plant Communities.

The persimmon grows or starts to grow in many diverse habitats but it does not occur in large numbers in any of these after it reaches maturity as do pine, oak and many other trees.

In the rich flood plains of the river valleys the persimmon reaches the maximum size. In the lower Mississippi River valley trees may be found that are 115 feet high, that are 70 or 80 feet to the lowest branches and that have a diameter of six feet or more. In the most favorable habitats of the middle and inner Costal Section of the Carolinas, the tree rarely exceeds 50 or 60 feet in height and a diameter of 18 inches. A few are larger. The usual type of upland tree in the Carolinas seems to be from 30 to 40 feet in height and eight to twelve inches in diameter.

The persimmon is smaller as the elevation increases, so large trees are not common in the Mountain Section. Small trees and shrubs, however, were seen as high as 2500 feet elevation around Ashville, N. C. and at 3500 feet when preceeded by cultivation.

The chief environments are not always the same in different parts of the Carolinas and may be found more variable when studies made in larger areas are reported. In certain areas it is found more commonly on the flood plains or near the margins of swamps as in certain portions of the central and eastern Carolinas. In other areas the upland environments are the most common as in the western part of these states.

The persimmon grows abundantly as shrubby compact growth or as small trees, more or less scattered around the edge of alder swamps. It is sometimes found alone in these situations but red maple (*Acer rubrum* L.) is often found with it. Each species may occur in separate groups spaced about the margin of the alder swamp or they may be very generally mixed together. Sometimes it may be mixed with willow (*Salix sp?*) although when willow occurs in any quanity it usually preceeds it.

In case of a gradual drying or maturing of the alder swamps the persimmon is often found in the alder area sometimes as scattered small trees or even in clumps in the higher areas.

The loblolly pine (*Pinus taeda* L.) and the yellow pine (*Pinus echinata* Mill.) enter as a part of many successions in a large portion of the Carolinas but they are not usually seen

near an alder swamp unless it is near a slope. In that case the pine may grow up to and even into the alders on that side. In case the persimmon has followed the alders on the slope side it will be shaded out by the pine.

On the stream side of the alder swamp willow may succeed the alder, to be followed by persimmon, red maple and sometimes blackberry and smilax for a time. This seems to be one of the situations that allows some trees to attain maximum size since the dominant trees of the flood plain do not always crowd it as much as do the pine from the slope side. Groups of small and medium sized persimmon trees are often seen near the alder swamps that are rapidly drying. Those nearest the swamp are usually the smallest indicating that the swamp is decreasing in size. Grass often starts around these groups of trees and when pasturing follows there is very little then to hinder further growth. But even in these situations the persimmon is only a subdominant species, so in spite of the large numbers that start, but few large trees are ever found and these are not commonly together. In one situation noticed three years ago persimmon was grouped around alder on a stream bank, but both are now dying out under the more vigorous growth of tulip and other deciduous trees.

In some areas of the western Carolinas the persimmon grows around the groups of mountain laurel when it is growing on the banks of rapidly flowing streams. Both deciduous and evergreen trees usually grow very close to these openings, however, so the persimmon never becomes very large.

The way the native persimmon occurs around the swamps containing *Cornus stricta* seems to be very similar to the alder swamp relationship.

The persimmon often enters successions after *Andropogon*, *Erigerion* or *Syntherisma* with pine. However, it is never found with pine after they attain maturity so it appears that the pine growth being more rapid shades the persimmon out. The persimmon is sometimes in these situations without pine, but it is not supposed that it will ever be long before the pine does enter, since a group of them never attains large size.

The persimmon is a common undergrowth in both the loblolly and yellow pine forests, provided the shade be not too dense. However, it gradually dies out as the light requirement increases unless an opening occurs in the pine, in which case, trees of moderate size sometimes develop. If the pine are too

thick and the shade very dense few or no seedlings of the persimmon start. If the pine growth be very open many other shrubs or seedlings (including oaks and Liquidambar) will start and no persimmon will be found.

If a growth of pine, either loblolly or yellow, which has much of the shruby growth in it be cut, as often occurs, some of the smaller persimmon is usually left. This gives these seedlings an opportunity for growth since they are now unhindered by the pine seedlings which, although they start very soon along with blackberry, *Ergerion* and other weeds, are not eliminative factors for some years. The pine stumps and roots decay rapidly and in a few years the ground may be cleared, very easily, of pine seedlings and rotten stumps. The persimmon meanwhile has grown to some size and is doubtless not all eliminated in the clean up as cultivation proceeds around many trees in fields that have had this history. In case all of the persimmon trees and seedlings are cut in clearing land for cultivation it is a persistent grower coming up year after year from the roots, after all other trees or shrubs are dead. Even fires do not usually kill the roots. Early growth from roots is rapid and unless the grower is persistent these will develop to fruiting trees and thus this serves as another source of the trees of moderate size scattered over cultivated fields.

One of the first trees to be found on much washed and barren areas is the persimmon. It often starts here and grows for years before weeds, *Andropogon* or trees other than the persimmon do, and often attains size large enough to produce fruit.

The persimmon starts in many places other than those noted above. A few of these will be mentioned without any discussion. It is one of the common roadside shrubs and frequently a tree will be found that has developed from this situation. It starts commonly along railroads and even between the ties. It grows abundantly as a shrub on exposed banks as along railroad or highway cuts and fills. Oak, pine, cherry or other seedling may or may not occur along with it.

Small trees or shrubs of the persimmon are sometimes found growing on the banks of small streams, like red maple or tulip, in which case, alder and willow may not have preceded them. It also grows in small numbers sucessfully and to a large size sometimes along the edge of the narrow strip of

densely wooded area that borders the rivers of North Carolina and South Carolina.

A few places have been observed where the persimmon does not grow or at least it occurs uncommonly. It does not occur in the sand dunes of the eastern coast except in rare cases, where more mesophytic conditions than usual exist. It does not grow commonly as a tree in the Savannahs nor in the long leaf pine areas. In these situations it sometimes occurs as a margin shrub or small tree along roads and improved areas. It is not found in the scrub oak region of the Sand Hill section except as a small margin growth or in low ground where more mesophytic conditions exist and then it rarely becomes very large.

A Host and Reservoir for Certain Destructive Insects.

The culture of the Japanese persimmon and the native persimmon for their fruits and the native persimmon as a stock for Japanese persimmon scions has been encouraged, in part, because of their apparent freedom from insect pests. Some studies, made by the writer, of the insects affecting these trees show that both the Japanese persimmon and the native persimmon are less subject to insect damage than the majority of fruit trees but also that several species of insects bear important relationships to them.

The native persimmon is attacked chiefly by leaf eaters, leaf-sucking insects, borers and scale insects. No insect pests of the fruit have been noted in the Carolinas. One gall forming mite is abundant. In this paper, however, only insects that are common on the native persimmon and that bear important relationships to other economic plants are considered. Since very little information has been reported concerning the persimmon psylla, the most characteristic pest of the native persimmon and the Japanese persimmon as well, a brief discussion of it is included.

THE PERSIMMON PSYLLA.

The persimmon psylla, *Trioza diospyri* Ashmead, (a Homopterous sucking insect), attacks the native persimmon and the Japanese persimmon chiefly when the insect is in the nymphal stage. The feeding of the adults rarely causes apparent damage. The largest numbers of the insects and the maximum

damage occur in the spring and summer when the leaves are young and growing, before control by the parasites and predators has become effective and while the female psyllas are laying the largest number of eggs. During late summer and fall one rarely finds this insect in numbers on the Japanese persimmon. It also becomes most uncommon on the native persimmon. At this time, it is found only on the young shrubby growth where some of the leaves are still young and growing. The injury on larger trees where growth is not succulent is never great.

FIGURE 2

Development and *Description.*

The persimmon psylla, occurs in three different stages: i.e., the egg (Fig. 2), the nymph or developing young (Fig. 3), and the adult. The latter, when mature, is a shiny black insect about 2.5 millimeters long with transparent wings raised vertically over its body when at rest and having one ivory white line on either side of the abdomen anteriorally. They appear somewhat like graceful aphids but, unlike them, have the habit of jumping quickly.

Females that emerged in the insectary on known dates lived from 6 to 39 days with an average of 16.8 days. They laid eggs in from two to nine days after emergence. The maximum number of eggs laid by one female on test was 1,173. The average number of eggs laid by the females of an early generation was 230.5; by a later generation, 173.6 and by a mid-summer generation 37.

The preoviposition period of 311 females averaged 5 days. Mating usually occurs a number of times at varied intervals beginning within a day or two after the females emerged. The male walks up beside the female, the posterior end of the abdomen curves around to the female and copulation takes place while they stand beside each other.

The elongate-ovate eggs of the persimmon psylla are found lying flat on the succulent growth of the persimmon. They are about .01 inch in length with the larger end curved down and attached while a short pointed portion curves away from the support at the smaller end. The eggs are pale white, turning to yellow or brownish yellow before hatching. They are laid singly, usually rather uniformly arranged in rows along the margin of the leaf, on the surface of the leaf, or on the petiole or stem. They may also be found very generally scattered over these areas. Sometimes they are found scattered or grouped in the axils of the leaves or around dormant buds.

The period of incubation of 36,770 eggs laid by ninety-nine females of three generations during the period from May 28, 1926 to July 16, 1926 averaged 8.6 days with a maximum of 15 days and a minimum of 4 days.

In the early stages the nymphs are minute, elongate, rounded insects usually clear white in color (occasionally a brownish red) with very few spines. The older nymphs are much flattened and strongly fringed (Fig. 3). They cling very tightly to the leaf in such a way that it is very difficult for other insects to attack the soft ventral surface of the abdomen. In the last instar the nymphs assume a bluish color. They are usually protected inside folds of the leaves.

The nymphs excrete a watery fluid, as do aphids, which is enclosed in a thin membrane. The mass is cylindrical in form when issuing from the psylla nymphs and may remain so, or it may coil somewhat as a watch spring, or break up into globular masses. These excretions are gradually shaken from the folds of the leaves, where many nymphs develop, by wind

or other disturbances. When the nymphs are in exposed positions they fall directly to the ground. The leaves are thus not soiled by the excretions and fungous diseases have not the opportunity to grow as they do in excretions from aphids. It seems that this adaptation may be correlated with the formation of the leaf rolls. Were it not for this adaptation

FIGURE 3

these leaf rolls would be filled with a mass of sweetened, sticky excretions that would probably very soon render them unfit for use by the insect.

When the nymphs are ready to transform they crawl to an exposed surface, usually on the leaves, and the adult insect emerges through a dorsal longitudinal slit in the head and thorax. The newly emerged adult is greenish in color.

Habits and Damage.

The nymphs may be found on practically all the growing leaves of the native and the Japanese persimmon since the shape of these leaves can be modified. One generation of nymphs is usually all that develops on one leaf as the leaves are then older and are not modified by the insect.

The nymphs are usually found on the lower surface of the growing leaves of the native persimmon near the margin with the edge folded or rolled more or less tightly over them (Fig. 4). Sometimes they occur on the upper surface of the leaves with the edges turned up over them. A few are found on the upper surface of the leaves near the tip of the mid-veins with each side of the leaves raised vertically and tightly enclosing the insects. Occasionally they are found scattered over the leaves generally. Some cling tightly to the sides of the veins.

On the Japanese persimmon these insects rarely form folds but they do produce indentations or pits on the lower surface of the leaves. They do not stay on the Japanese persimmon as long each year as they do on the native persimmon.

Most of the damage to the native persimmon is in the stunting of growth because most of the leaf folds straighten and recover, very largely, after the nymphs transform to adults. Some permanent mechanical injury occurs sometimes when the number of nymphs in one fold is very great. At times the leaves are so severely injured they curl, wilt, die and fall from the tree. A few cases have been seen where the growing tips of the branches were killed.

The damage caused by this pest to the Japanese persimmon is also chiefly in the stunting of growth since the change the insect causes to the leaves is usually slight and recovery is rapid after they become adults.

Natural Control.

The persimmon psylla is preyed upon by the larvæ of the syrphid, *Allograpta obliqua* Say, which usually pry up the body of the nymphs, puncture the ventral abdominal surface and suck the body fluids. This syrphid has been very abundant the last few years during the early summer.

The control of the nymphs of the persimmon psylla by an internal parasite, *Psyllaephagus trioziphagus* (How.), becomes highly effective during the late summer. This parasite, how-

ever, is rarely found during the early part of the season. Several species of ladybird beetles (larvæ and adults) are also commonly predaceous on the nymphs. Of these, *Hippodamia convergens* Guer, and the one usually called *Megilla maculata* DeGeer, are the most common.

FIGURE 4

Artificial Control.

Only partial control of the persimmon psylla has been secured by using nicotine sulfate sprays because it comes in contact with very few of the nymphs that are protected in the folds of the leaves. Some growers, however, report it as being fairly satisfactory since it kills many of the eggs. The eggs are usually laid on the exposed surfaces. Six percent nicotine sulfate with lime hydrate as a dust and Cyanogas "S" dust (one half calcium cyanide and one-half sulfur) have both given better control of the nymphs and adults in preliminary tests than have sprays of nicotine sulfate.

THE TWIG GIRDLER.

The twig girdler, *Oncideres cingulata* Say, is a severe menace to the pecan industry in many parts of the South because it girdles large numbers of fruited branches before the nuts are ripe. The girdled branches usually break from the tree soon after they are girdled. Even in pecan orchards where the twig girdler is controlled by destroying the girdled branches of the pecan trees which contain eggs or larvæ or both of the pests, the trees may be subject to the attack of the adults, each fall, which have matured from severed branches of near-by native persimmon trees.

When the branches are girdled it results in numerous twigs growing out near the girdled end thus giving a "bunched" effect. This is common on trees of all sizes.

In the experience of the writer, judging from the comparative number of twigs girdled on the several host plants in the Carolinas, the persimmon appears to be the favorite host plant of the pest. Because of this fact, the native persimmon serves as a tremendous reservoir for the twig girdler as a source of infestation for pecan orchards. This makes it necessary to burn the girdled branches of near-by persimmon trees as well as those of the pecan and hickory in the control of this insect. Persimmon trees having no value could be destroyed and this control measure would not have to be repeated each year.

The twig girdler is not abundant and a menace in all areas where either the pecan of the persimmon grow.

OTHER INSECTS.

The San Jose scale is the most common scale of economic importance that occurs on the native persimmon. Infestations are very unusual, however, unless the trees are near orchards, where San Jose scale is common. Heavy infestations and severe damage have been caused by the webworm, identified as the summer brood of *Hyphantria cunea* Drury, during each year in the area under observation.

There are other insects that are common on the native persimmon. Some of these attack no other hosts while others are more or less general in their feeding habits. These will be included in another report.

SUMMARY.

1. The persimmon grows or starts to grow in many habitats in the Carolinas but does not occur in large numbers in any of these after maturity. This is because of the subdominant place it has in relation to other trees.

2. It starts to grow as a shrub or tree, in the margin of alder swamps, in successions after *Andropogon*, *Erigerion*, or *Syntherisma*, as an undergrowth in certain forests, in open and barren fields and in many other places but it is usually shaded out, for the most part, by pine and deciduous trees.

3. The persimmon is a host and reservoir for certain insects of economic importance in the Carolinas.

4. Persimmon psylla nymphs suck the juices from the leaves of both the native and Japanese persimmon and often cause folds and rolls in leaves of the native persimmon, and indentations or pits on the lower surface of the leaves of the Japanese persimmon.

5. Soapy nicotine sulfate solutions gave some control of the egg stage while nicotine sulfate with lime hydrate as a dust and Cyanogas "S" dusting mixture were more effective in the control of nymph and adult stages.

6. Persimmon is a host and the chief reservoir for the twig girdler in many sections where pecans are grown, and thus serves as a menace to this industry. It is an important host of the webworm and is occasionally infested with San Jose scale.

THE CELLOIDIN INJECTION OF BLOOD VESSELS.*

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Leonardo da Vinci, living in the 15th century, was, so far as we are able to determine, the first scientist to use injection methods to demonstrate the blood vessels. Garrison (1) illustrates a drawing from Leonardo's Quaderni in which the ramifications of the femoral artery give one the impression of an injection. Since this pioneer work anatomists have, from time to time, used this method for the demonstration of not only the larger blood vessels but also to demonstrate the capillary circulation. Among the more recent work should be mentioned that of, Huber (2) on the circulation of the kidney, Gross and Kugel (3) on the circulation of the heart valves, and that of Hinman and his coworkers (4) on the changes in the circulation in the hydronephrotic kidney, After all this most excellent work, we hesitate to add another paper on the dry details of technique, but because of the cordial reception which has been given to demonstrations which have been made at various scientific meetings of specimens prepared by celloidin injection of the human kidney, we feel that the technique may be of use to other workers in the same or allied fields of biology. The method as given here has been developed so as to give consistent results on the human kidney, but by slight modification of the strength of celloidin and the pressure will give equally good results on the kidney or other organs from the lower animals.

Method: The kidney is removed from the body as soon after death as possible, but good results may be secured as long as 30 hours after death. Particular care should be taken in sectioning the renal artery. It should by preference, be cut with a piece of aorta attached, so that a large canula may be inserted and also that it may be secured at a point at least one-half inch proximal to the point of primary division. (It has been our experience that a considerable number of human kidneys show an anomalous vessel arising from the main stem renal artery just distal to its origin from the aorta and entering the lower pole of the kidney directly). Further, one should be careful to remove

*Read before the Medical Science Section, Ohio Academy of Science, April 9, 1926.

the kidney with the perirenal tissue attached since the capsular branches of the renal artery in the human kidney are of considerable size and will give trouble in ligation later if a goodly portion of the tissue about the kidney is not included. As soon as possible after its removal from the body the kidney should be taken to the laboratory for the actual injection. A canula is tied into the renal artery and connected to the city water supply, in this manner allowing water to flow through the kidney from the water lines until 125 to 150 gallons of water are forced through the capillary bed of the organ. This in our experience is most satisfactorily accomplished under a head of 600 mm. of Hg. flowing for

FIGURE 1

24 hours. (Special clot dissolvers and vaso-dilators as used by some authors have not shown any advantage over this method in our hands). After this thorough washing the kidney is placed in a vessel and covered with water and the canula connected to the injection apparatus. A current of air is passed through the arterial tree and as the kidney is submerged in water, all leaks are readily detected and ligated. This is important since to maintain the required pressure of injection later and to avoid the loss of considerable quantities of celloidin, the arterial tree must be a closed system. When one is satisfied that all leaks are secured, a bottle of thin celloidin is placed in the circuit and a clamp placed on the rubber tube leading to the canula. By air pressure the pressure in the bottle of celloidin is raised to 600 mm. of Hg., at which time the clamp is suddenly released and the full pressure is allowed to enter the kidney vessels at once. This is important since a gradual raising of the pressure will not give a perfect injection. If the celloidin is of the

correct strength, it will pass into the glomeruli but will not pass beyond because of its viscosity. The thin celloidin injection is maintained for two to six hours when it is replaced by the thick celloidin which in injected under a constant head of 600 mm. of Hg. for twenty-four hours. During the entire procedure the organ is kept immersed is water. For a source of pressure we use tanks of compressed carbon dioxide to which a reducing valve is attached. In this manner a constant pressure may be maintained for hours. After twenty-four hours the canula is disconnected and the capsule and perirenal tissue stripped from the kidney. The kidney is then placed in a 75 per cent solution of hydrochloric acid which in 24 to 48 hours will so completely digest the soft parts that a gentle stream of water will remove them, leaving a celloidin cast of the blood vessels.

FIGURE 2

The celloidin solutions used in the injections are:

THIN CELLOIDIN.

Paraloidin	2.75 gms.
Camphor	2.0 gms.
Acetone	100.0 cc.

THICK CELLOIDIN.

Paraloidin	10.0 gms.
Camphor	8.0 gms.
Acetone	100.0 cc.

The celloidin may be colored by various fat soluble dyes. We have used Scharlet R for red and Methyl green for blue. If it is desired to inject the veins a similar technique is used except that 200 mm.

of Hg. is used instead of 600 mm. For the pelvis we use 20 per cent celloidin and 15 per cent camphor in acetone and inject under 60 to 75 mm. of Hg.

The accompanying figures illustrate both the completeness and the detail of injection that may be secured by this method.

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CISSIA MITCHELLI (FRENCH) FOUND IN OHIO, WITH NOTES ON ITS HABITS.

LEPIDOPTERA—SATYRIDÆ.

JOHN C. PALLISTER,
Cleveland Museum of Natural History.

Cissia mitchelli was first described in 1889, by Professor French, from specimens collected from Cass County, Michigan, by Professor J. N. Mitchell. Professor Mitchell also believed that he had observed it in central Michigan. The first specimens were collected in a dry upland meadow, near a wet meadow and marsh, but later Professor Mitchell found them much more abundant in the marshy area. He writes, "It flies low, for short distances, in a weakly manner, and is best started by beating up, or by walking rapidly and noisily through the grass. * * * If there is more than one brood of Mitchelli in a season, the last one begins to fly July 1st. I have taken it from July 1st-10th. As far as I can tell it comes in quickly and goes off the field rather abruptly after a short period of life". On July 10, 1890, Mr. Charles W. Johnson captured one specimen near Dover, Morris County, New Jersey.

On July 4th, 1925, I captured six specimens of this rare butterfly in a swampy meadow on the edge of a peat swamp, near Streetsboro, Portage County, Ohio. The insect was very abundant, but specimens in fair or good condition were exceedingly hard to find. About two weeks later when I again had the opportunity of visiting this spot not a specimen was observed.

In 1926, on July 4th, I visited the spot where I had collected and seen this butterfly the previous year. There wasn't an individual to be found. Six days later, July 10th, I returned and found the insect plentiful, most of them in very good condition showing that the adults had just matured. I did not have an opportunity to return until the 24th of July, at which time only a single specimen, a female, was seen.

Cissia mitchelli appears to be confined to an open swampy peat meadow about an acre in extent. The vegetation of this area is low, although surrounding this spot, it becomes rank and tall. The dominant growth is a swamp grass, Virginia chain-fern (Anchistia virginica), and bedstraw (Galium boreale). Scattered throughout the area are dwarf specimens of the common blue wood aster (Aster cordifolius), and the showy ladies'-slipper (Cypripedium reginæ). Tamarack, maple, and choke cherry trees partly hem in this spot. The rest is bordered on one side by cat-tails which are gradually encroaching, and on the other side by a rank growth of swamp grass and weeds.

Cissia mitchelli is very easily captured. It rests quietly on a blade of grass or a weed stem, usually with the head down, until approached to within three or four feet. The butterfly will flutter up with a weak irregular flight, typical of the satyrids, rising seldom more than four or five feet from the ground, and settle again about ten feet away. The female is slightly stronger in flight than the male. At no time did I observe any protracted flight; moreover the males showed little vigor or tenacity when fighting. I observed no insect either feeding or ovipositing.

Associated with this butterfly were specimens of Satyrodes canthus and Cercyonis alope. The most striking feature of the habits of this butterfly is its confinement to one small area. Although there are many similar spots throughout this several hundred acre peat swamp, no other place yielded any specimens of this insect.

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